

# The Solar System

The sun and all the objects orbiting around it are collectively referred to as the **solar system**.

The solar system consists of eight large objects called **planets**, at least three smaller objects called **dwarf planets**, and countless other asteroids, comets and meteoroids.

These objects **orbit**, or circle around, the sun because of the force of the sun's gravity. Imagine an object tied to a string. If you hold the end of the string, you can swing the object around so it orbits your hand. In this model, the sun is your hand, the object is a planet, and the string represents the force of gravity.

There are eight planets orbiting the sun in our solar system. Planets are defined as celestial bodies that orbit the sun and are large enough that their gravity pulls them into a nearly spherical shape. A planet must also be the major body in the area. This means that there are no larger objects sharing their orbit. Starting at the sun and moving out, the planets in our solar system are called Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus and Neptune.

The first four planets, called **terrestrial planets**, are similar to Earth. They are solid and relatively small (Earth is the largest of this type of planet). The last four planets are called **gas giants**. They are very large, with the largest gas giant, Jupiter, 318 times the mass of Earth. They are also gaseous.

Many scientists believe that gas giants have a solid core, but this core is underneath many layers of gas, and the air pressure and gravity at that level would destroy any humans or machinery sent there. Planets orbit the sun in **elliptical**, or oval-shaped, orbits.

The planets orbit in roughly the same **plane**, which means if their orbits are lined up, they make a relatively flat surface. Between the terrestrial planets and the gas giants, there is a band of space rocks known as the **asteroid belt**.

Dwarf planets are defined as objects that orbit the sun that are large enough that their gravity pulls them into a spherical shape. Unlike a planet, a dwarf planet is not the major body in the area. Dwarf planets include Pluto, which is found past Neptune; Eris, which was discovered in 2003 and is past Pluto; and Ceres, the largest body in the asteroid belt.

There are many more possible dwarf planets that we have discovered that need to be evaluated, and we may find more in the future. At this point, the term 'dwarf planet' only refers to objects found in our own solar system, since we do not have the technology to find dwarf planets around other stars.

In the 1990s, astronomers began discovering planets around other stars, which are called **extrasolar planets**. Astronomers found these planets by measuring the gravitational pull of the planets on the star, which could be seen by the star 'wobbling' in space.

Most of the planets that have been discovered are gas giants that orbit their stars very closely, similar to Mercury's orbit. This does not mean that other Earth-like planets do not exist. It could mean that we just do not have the technology to find them yet.

## Galileo Galilei

A 17th century Italian scientist, Galileo Galilei, was the first to use a telescope. During his lifetime, he made many important discoveries in physics and **astronomy**. Galileo was the first to formulate the first and second laws of motion (movement). As a result of his new, daring scientific statements, Galileo was accused by the Roman church of being a heretic (a Christian who disagrees with traditional church laws).

## Isaac Newton

Mathematician and physicist Isaac Newton lived in England. Newton defined the laws of motion and universal gravitation which he used to predict precisely the motions of stars and the planets around the sun. Isaac Newton was the first scientist who defined physical force using mathematics. **Gravitation** is a force of attraction between all objects in the universe.

Newton was the first to show that all objects on Earth as well as other planets, stars and comets move according to the same natural laws. Newton was also a founder of classical mechanics. Classical mechanics is a field of physics that studies the movement of macroscopic objects. Macroscopic objects are all objects that can be seen with the naked eye. Machines, machine parts, planets and galaxies are examples of macroscopic objects.

## Henry Cavendish

Henry Cavendish was an 18th century English scientist. Cavendish was the first scientist to calculate the density (weight per unit volume) of the Earth. The results of his research were also used to calculate the mass of the Earth. Cavendish also made some very important discoveries in the physics of electricity. Many unpublished works of Henry Cavendish were discovered by other scientists after his death. These scientists realised that the credit for most of his discoveries had already been given to other scientists.

## Albert Einstein

German-born scientist Albert Einstein was the first to discover the relationship between the mass of an object and the energy that it can produce. Einstein's theory of motion and energy is called the **theory of relativity**. Einstein is often called the greatest scientist of the 20th century.

With the rapid development of physics in the 20th century, it was discovered that physical force is the result of interacting (acting together) elementary particles. Elementary particles are the smallest units of matter. Molecules, atoms, electrons, protons and neutrons are examples of elementary particles.

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